

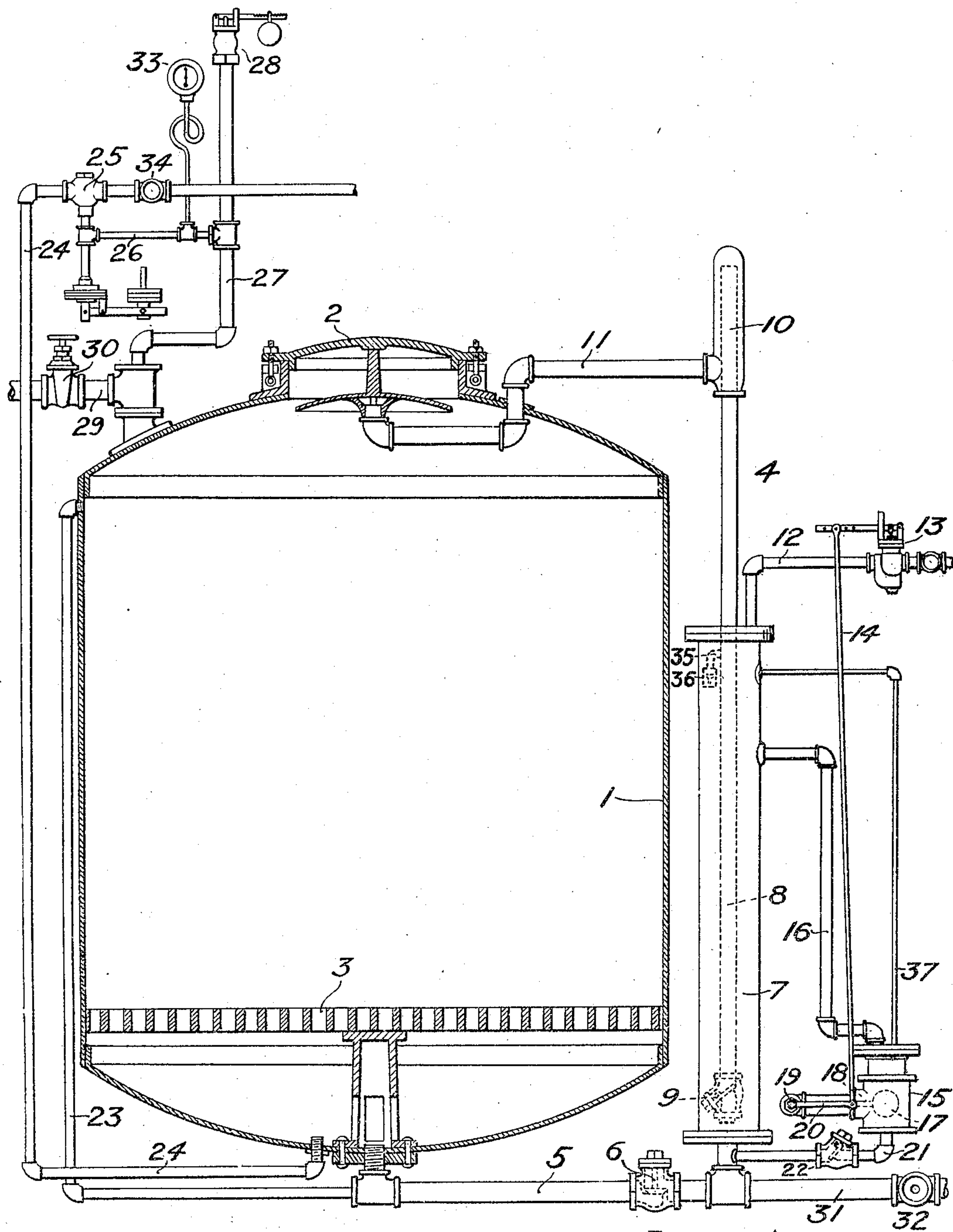
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PATENTED NOV. 22, 1904.

E. D. JEFFERSON.
VOMITING KEIR.

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NO MODEL.



Witnesses
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VOMITING-KEIR.

SPECIFICATION forming part of Letters Patent No. 775,450, dated November 22, 1904.

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To all whom it may concern:

Be it known that I, EUGENE D. JEFFERSON, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Vomiting-Keirs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improvement in vomiting-keirs.

The object of the invention is to reorganize and improve vomiting-keirs, particularly the vomiting-keir for which Letters Patent of the United States was granted to Charles S. Shepard and myself on October 25, 1899, No. 612,874. The said patent relates to a closed bleaching-keir in which the bleaching liquor may be maintained at a temperature somewhat above the normal boiling-point of the liquor in order to accelerate the chemical action of the liquor. To this end the keir and the vomiting-pipe are closed and the liquor therein is constantly subject to a pressure above that of the atmosphere in order to prevent evaporation of the liquor or loss of gaseous constituents thereof, which would otherwise occur owing to the high temperature. In the keir of the said patent means are provided for intermittently raising the liquor which collects at the bottom of the keir to the top thereof and for discharging the liquor upon the fabric in the keir. These means and all other intermittently-operating means previously proposed for the same purpose in vomiting-keirs, so far as I am aware, depend for their intermittent action upon constant fluctuations of the pressure in the keir, the said means operating until the pressure in the keir rises to a certain point and then remaining inactive until the pressure falls, owing to the cooling and condensation of vapor in the keir. Such fluctuations of pressure are undesirable, as they are accompanied by corresponding and proportionate fluctuations of temperature in the bleaching liquor, owing to the condensation and reëvaporation of the liquor under

the fluctuations of pressure. The temperature of the liquor is therefore not maintained at the highest practicable degree, but fluctuates between this point and a lower point, with a consequent decrease of efficiency in the operation of the keir.

To avoid the objectionable result above described, the present invention contemplates the use, in connection with a keir and a vomiting-pipe connecting the bottom and the top thereof, of automatic means operating intermittently to raise to the top of the keir the liquor which has percolated to the bottom of the keir through the fabric therein, the said means operating independently of the pressure or the temperature of the contents of the keir, so that the temperature may be maintained constantly at the most favorable point, irrespective of the operation of the means for moving the liquor.

Another feature of the invention consists in the use of automatic controlling means for controlling the action of the liquor-raising means operating upon the accumulation of a sufficient quantity of liquor to set the liquor-raising means in operation and to cause the operation thereof to cease when the liquor has been raised.

In the keir of the said patent steam under pressure was used to raise the liquor from the bottom to the top of the keir, and the same steam was also the means for heating the liquor and maintaining the proper temperature in the keir. It is sometimes considered desirable to utilize exhaust-steam to heat keirs; but as the pressure of exhaust-steam is not sufficient to raise the liquor it is necessary to use live steam for this purpose. The present invention further contemplates therefore a keir in which live steam is used, only so far as is necessary, to raise the liquor, automatic means being used to control the admission of live steam, operating, upon the collection of a certain amount of liquor in the lower part of the apparatus, to admit sufficient steam to raise the same and to interrupt the flow of live steam when the liquor has been raised, while the temperature of the keir is maintained by exhaust-steam admitted to the bottom thereof.

Other features of the invention will be noted in connection with the description of the illustrated embodiment thereof.

Referring to the drawing, which shows the keir in section and the pipes and connections for heating the liquor in the keir and for raising the liquor from the bottom to the top of the keir, the keir proper, 1, consists of the usual sheet-metal vessel provided with a removable cover 2, secured by bolts in the usual manner at the top thereof. In the keir is the usual grid 3, on which the materials to be treated are laid. The vomiting-pipe consists of a pipe and suitable connections forming a closed passage connecting the top and bottom of the keir. This vomiting-pipe is indicated in a general way by the reference character 4, which is intended to designate the pipe as a whole. A portion 5 of the vomiting-pipe extending from the bottom of the keir leads through the check-valve 6, which prevents back flow of liquor into the bottom of the keir. The pipe 5 discharges into the bottom of a trap 7, which is made considerably larger than the vomiting-pipe proper and sufficient to hold a considerable body of liquor. Into the trap 7 depends a pipe 8, having a check-valve 9 at its foot, which check-valve opens upward, so that liquors may pass up through said check-valve, but may not return therethrough. The liquors which pass through the pipe 8 are discharged into the loop 10, which consists of a shell secured to the pipe below its top and which discharges from its side through the pipe 11 into the keir in the usual manner. The liquor is forced up through the vomiting-pipe 4 by means of steam-pressure, a steam-pipe 12 being provided which discharges live steam into the top of the trap 7 after the same has been filled.

Automatic means are provided for opening and closing the steam-pipe 12 at proper intervals in order to cause the above-described operation to take place. In the illustrated embodiment of the present invention the steam-pipe 12 is provided with a valve 13, which is a well-known form of commercial balanced valve known as the "Waters balanced lever-valve." A link 14 connects the lever of this valve 13 with a device for opening and closing the said steam-valve 13. This device consists of a receptacle 15, connected by a pipe 16 with the upper part of the trap 7. The receptacle 15 contains a float 17, connected by a lever 18 with a rock-shaft 19, which is extended out through a packed joint and carries upon its outer end a lever 20, which is connected by means of the link 14, above described, with the steam-valve. The lower part of the receptacle 15 is connected by a pipe 21 with the bottom pipe 5, a check-valve 22 being provided to prevent liquor from flowing from the pipe 5 directly into the receptacle 15. A vent-pipe 37 connects the receptacle with the upper part of the trap.

The operation of this device is as follows: When the liquor in the keir flows out into the vomiting-pipe, it gradually rises in the trap 7 until it reaches the level of the opening into the pipe 16, whereupon liquor flows down through said pipe into the receptacle 15, the displaced air or vapor passing up through the vent-pipe 37, thereby lifting the float 17 and opening the steam-valve 13 and admitting steam above the liquor in the trap 7. The pressure of the steam operates to close the check-valve 6 and to force the liquor in the trap 7 and in the pipe 16 and receptacle 15 down into and up through the standing leg 8 of the vomiting-pipe, thence discharging it into the top of the keir, the check-valves 9 and 22 being opened by this movement of the liquids and the level of the liquids in the trap 7 and the pipe 16 and receptacle 15 falling in unison. When the level reaches the bottom of the standing leg 8 of the vomiting-pipe, the level of the liquid in the receptacle 15 is sufficiently lowered to permit the float 17 again to fall, thereby again closing the steam-valve 13 and cutting off the steam-pressure. After the valve 13 has closed the condensation of the steam in the trap will eventually reduce the pressure therein sufficiently to permit a new supply of liquor to flow into the trap; but in order to make the operation of the apparatus more certain and rapid a vent 35 is used, connecting the upper part of the trap with the vomiting-pipe. This vent is so small as not materially to reduce the steam-pressure while the liquor is being discharged from the trap; but it is sufficiently large to permit the steam to escape from the trap after the steam-valve has been closed. A short pipe provided with a check-valve 36 is attached to the vent to prevent the liquor standing in the vomiting-pipe from escaping into the trap.

The check-valve 9 is preferably located, as shown in the drawing, at the foot of the standing leg 8; but it is within the purview of the invention viewed in its broader aspects to locate this check-valve at any desired point in the vomiting-pipe—as, for instance, at the point indicated in the said patent. It is desirable in this form of apparatus that the pressure at the top and at the bottom of the keir should be the same. The equalizing-pipe 23 is provided for this purpose, being connected at the top to the keir above the highest level of the liquor therein and to the bottom pipe 5 adjacent to the keir, whereby the pressures at the top and bottom of the keir may be equalized. For heating the contents of the keir there is provided the steam-pipe 24, which discharges into the bottom of the keir. This pipe 24 is provided with an automatic regulating-valve 25, which is connected by a pipe 26 through a pipe 27 with the keir, operating in the usual manner to regulate the amount of steam supplied to the keir for heating pur-

poses, according to the pressure in the keir. The pipe 27 is provided with a safety-valve 28 to blow off when the pressure exceeds the predetermined limit. The keir is filled through the pipe 29 from any convenient source, a valve 30 being provided by which to shut off the supply of liquor when a sufficient quantity has flowed into the keir. A pipe 31, connected to the bottom pipe 5 and provided with a valve 32, affords a means for drawing off the keir liquors after the operation has been completed. A steam-gage 33, conveniently connected with the pipe 26, is provided for indicating the keir-pressure.

It is to be observed that the steam-pipe 24, which conveniently has the usual valve 34 therein, is used to conduct exhaust-steam to the keir for the purpose of heating the same, and it is immaterial to the present invention whether this steam is admitted into the keir and condensed and mingled with the liquor therein or whether it simply passes through a heating-coil in the bottom of the keir and is thence discharged or returned to the boiler.

It is not intended, however, that the invention shall be limited to the use of exhaust-steam for heating purposes, as live steam is believed, by reason of the economies resulting therefrom, to be preferable in the economical use of the apparatus; but in some bleacheries it is desired to use exhaust-steam for heating purposes and the present construction affords provision for its use. The steam-pipe 12, however, must be supplied with steam under pressure, and in order to lift the liquors from the bottom to the top of the keir through the vomiting-pipe live steam is preferably employed for this purpose, although, of course, if exhaust-steam were to be had at sufficient pressure it would be within the purview of the invention to employ exhaust-steam at this place. This supply of steam, because of its function, may be referred to as the "motive" steam, by reason of the fact that it is employed as the motive power for lifting the keir liquors from the bottom to the top of the keir.

The present invention, viewed in its broader aspects, is not limited to an embodiment in which the motive-steam-pipe valve is actuated to be opened and closed as the result of a rise or fall of a level of liquid. Any automatic device for periodically opening and closing the motive-steam valve is within the contemplation of the invention. The preferred embodiment, however, of the invention contemplates the opening of the motive-steam valve whenever the trap fills to a predetermined level, so that at each opening of the motive-steam valve a certain quantity of liquor is carried over to the top of the keir. It is not intended that the invention should be limited to a construction in which the steam is shut off as soon as the predetermined quantity of liquid has been forced into the keir, as the in-

vention, in some aspects, is applicable to a keir operating upon the principles of the keir of the said patent, in which the live steam and liquid from the bottom of the keir are alternately forced into the top of the keir.

The form of the trap is immaterial to the operation of the device, since any receptacle of suitable capacity may be used to collect the liquor.

Where in the claims the word "trap" is used, it is intended to denote any receptacle connected with or forming part of the vomiting-pipe and arranged to collect liquor prior to its being raised through the vomiting-pipe.

Having thus described the invention, what is claimed is—

1. A vomiting-keir, having, in combination, a closed keir adapted to contain liquor under pressure, a closed vomiting-pipe connecting the bottom and the top of the keir, and automatic means operating independently of the pressure in the keir to intermittently raise the liquor through the vomiting-pipe and discharge it into the top of the keir, substantially as described.

2. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the bottom and the top of the keir, a trap connected with the vomiting-pipe, means for raising liquor from the trap through the vomiting-pipe to the top of the keir, and automatic means, actuated by the rise and fall of a liquor-level in a part of the said apparatus, for controlling the operation of the said liquor-raising means, substantially as described.

3. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the bottom and the top of the keir, a trap connected with the vomiting-pipe, means for raising liquor from the trap through the vomiting-pipe to the top of the keir, and automatic means for controlling the operation of the said liquor-raising means acting upon the accumulation of a certain amount of liquor in the trap to set the liquor-raising means in operation, substantially as described.

4. A vomiting-keir, having, in combination, a keir, a closed vomiting-pipe connecting the bottom and the top of the keir, a trap connected with the vomiting-pipe, a motive-steam pipe connected with the trap to admit steam thereto to force the contents thereof through the vomiting-pipe into the top of the keir, and automatic means operating independently of the pressure in the keir for controlling the flow of steam into the trap, substantially as described.

5. A vomiting-keir, having, in combination, a keir, a closed vomiting-pipe connecting the bottom and the top of the keir, a trap connected with the vomiting-pipe, a motive-steam pipe connected with the trap to admit steam thereto to force the contents thereof through the vomiting-pipe into the top of the keir, and automatic means for controlling the flow of

steam into the trap operating independently of the pressure in the keir to admit the steam intermittently into the trap, substantially as described.

5 6. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir, a motive-steam pipe connected with the vomiting-pipe and mechanism operating independently of the pressure in the
10 keir to intermittently open and close the motive-steam pipe, substantially as described.

7. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir, a motive-steam pipe connected with the vomiting-pipe, and intermit-
15 tently-operating mechanism to open and close the motive-steam pipe controlled by the rise and fall of a liquor-level in a part of the apparatus, substantially as described.

20 8. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir provided with a trap, a motive-steam pipe connected with the trap, and mechanism for opening the steam-pipe upon
25 the rise of the liquor in the trap to a certain level, and for closing it upon the fall of the liquor to a certain lower level, substantially as described.

9. A vomiting-keir, having, in combination,
30 a keir, a closed vomiting-pipe connecting the top and bottom of the keir, a motive-steam pipe connected with the vomiting-pipe, and mechanism operating independently of the pressure in the keir to intermittently open
35 and close the motive-steam pipe, substantially as described.

10. A vomiting-keir, having, in combination, a keir, a closed vomiting-pipe connecting the top and bottom of the keir, a motive-steam
40 pipe connected with the vomiting-pipe, and intermittently-operating mechanism to open and close the motive-steam pipe controlled by the rise and fall of a liquor-level in a part of the apparatus, substantially as described.

45 11. A vomiting-keir, having, in combination, a keir, a closed vomiting-pipe connecting the top and bottom of the keir provided with a trap, a motive-steam pipe connected with the trap, and intermittently-operating mechanism
50 to open and close the motive-steam pipe controlled by the rise and fall of a liquor-level in a part of the apparatus, substantially as described.

55 12. A vomiting-keir, having, in combination, a keir, a closed vomiting-pipe connecting

the top and bottom of the keir provided with a trap, a motive-steam pipe connected with the trap, and mechanism for opening the steam-pipe upon the rise of the liquor in the trap to a certain level and for closing it upon the fall
60 of the liquor to a certain lower level, substantially as described.

13. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir, an equalizing-pipe
65 connecting the top and bottom of the keir, a motive-steam pipe connected with the vomiting-pipe, and intermittently-operating mechanism to open and close the motive-steam pipe, substantially as described. 70

14. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir provided with a check-
75 valve to prevent flow toward the bottom of the keir, an equalizing-pipe connecting the top and bottom of the keir, a motive-steam pipe connected with the vomiting-pipe, and intermittently-operating mechanism to open and close the motive-steam pipe, substantially as de-
80 scribed. 80

15. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir provided with a check-
85 valve to prevent flow toward the bottom of the keir, a trap, an equalizing-pipe connecting the top and bottom of the keir, a motive-steam pipe connected with the trap, and intermittently-operating mechanism to open and close the motive-steam pipe controlled by the rise and
90 fall of a liquor-level in a part of the apparatus, substantially as described. 90

16. A vomiting-keir, having, in combination, a keir, a vomiting-pipe connecting the top and bottom of the keir provided with a check-
95 valve to prevent flow toward the bottom of the keir, a trap, an equalizing-pipe connecting the top and bottom of the keir, a motive-steam pipe connected with the trap, and mechanism for opening the steam-pipe upon the rise of the liquor in the trap to a certain level
100 and for closing it upon the fall of the liquor to a certain lower level, substantially as described. 100

In testimony whereof I affix my signature in presence of two witnesses.

EUGENE D. JEFFERSON.

Witnesses:

HORACE VAN EVEREN,
FARNUM F. DORSEY.